

NWIS Web Services Snapshot Tool for ArcGIS

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The Challenge

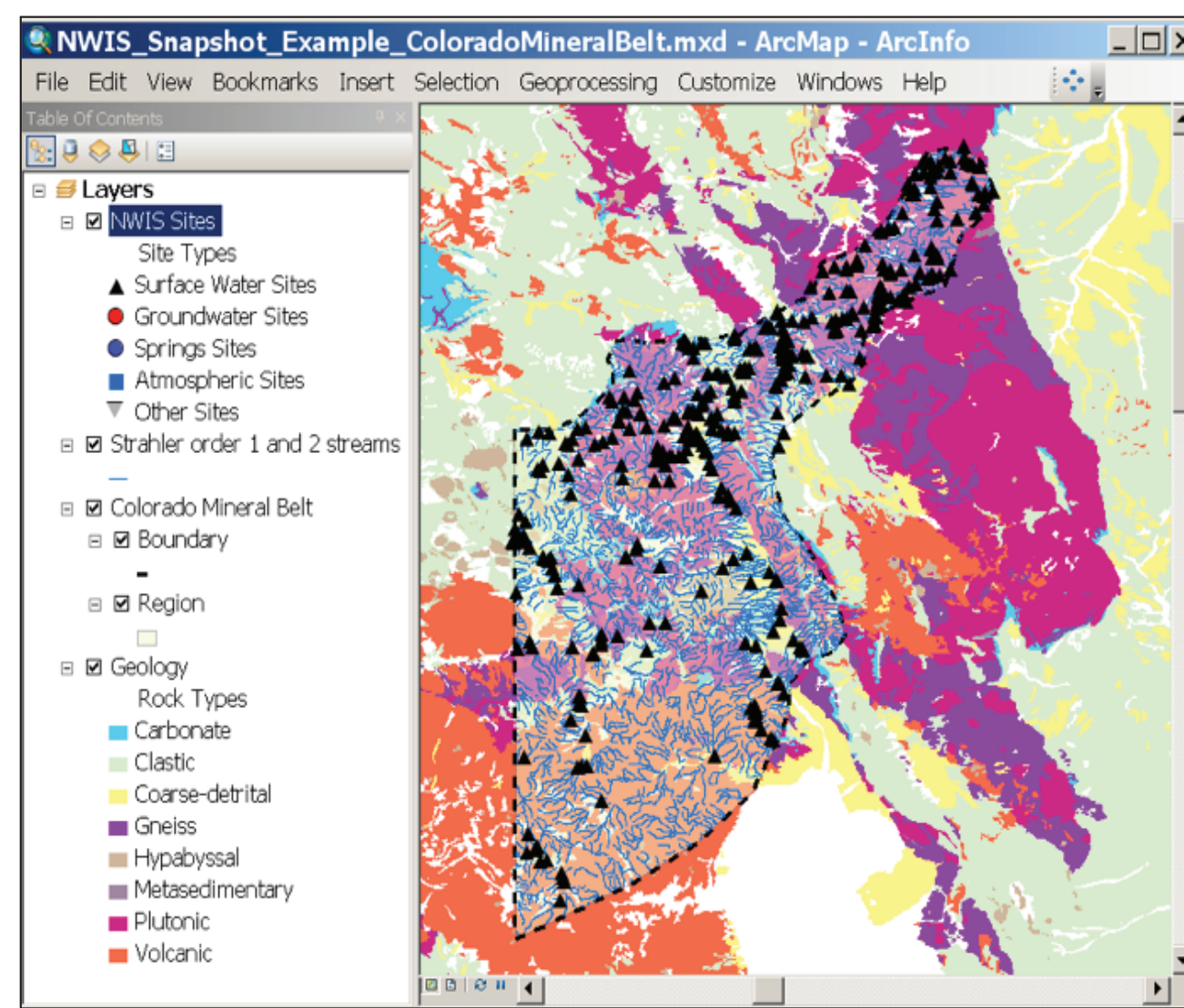
The National Water Information System (NWIS) is a database containing hydrologic information for more than 1.5 million surface water, groundwater, and atmospheric monitoring sites throughout the United States, many with a record of more than 100 years. NWIS data are considered the “gold standard,” the authoritative source of hydrologic information, and are accessed daily by USGS scientists and the public. Access to and management of NWIS data are fundamental to a variety of studies that examine the interrelations of the Earth’s hydrosphere, biosphere, lithosphere, and atmosphere. However, NWIS is challenging to use without considerable expertise and investment of time for users who are not water database experts.

Objectives

- Provide a way to retrieve and manage NWIS data from Web services
- Educate end-users on the NWIS database
- Leverage Web services and provide feedback to developers
- Document data omitted from Web services (for example, proprietary water quality results)
- Facilitate the integration of NWIS data with other datasets for interdisciplinary modeling and research

Integrating USGS Data: Colorado Mineral Belt Example

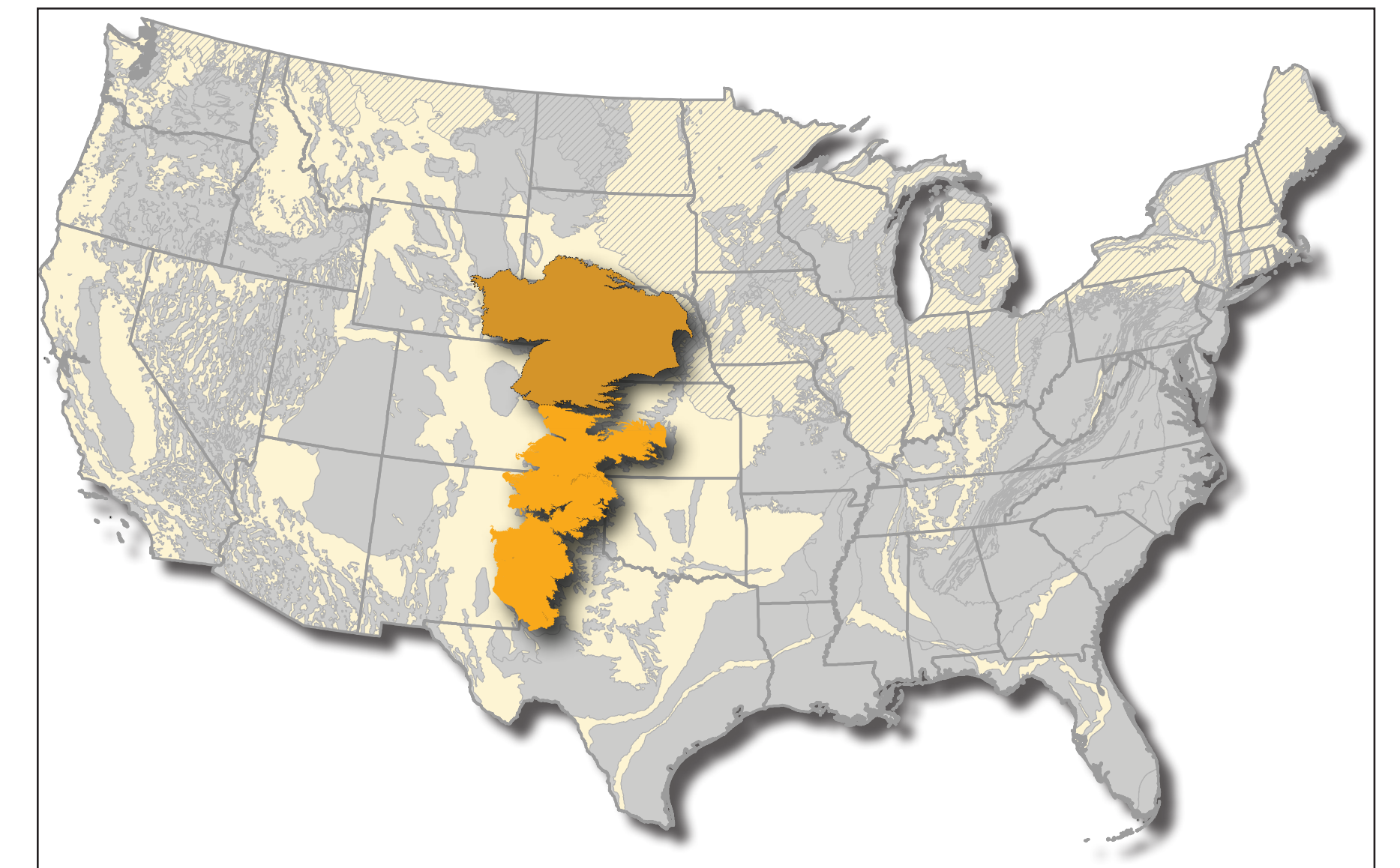
In this example, the Snapshot Tool is used to retrieve surface water-quality data for sites in the Colorado Mineral Belt. Water-quality data are integrated with data from the National Hydrography Dataset Plus (NHDPlus) and the USGS National Geologic Map Database to evaluate metal mobility in areas affected by historical mining, or that have mineralized or hydrothermally altered rocks (*after Wanty and others, 2009*).



Benefits to USGS Science

The Snapshot Tool allows scientists to explore hydrologic data while saving valuable time. It serves as an educational tool for new or infrequent NWIS users by translating the numerous codes associated with output files of NWIS data and enables efficient data retrieval and management for comprehensive integrated studies. Design and functionality of the publicly available Snapshot Tool are driven by the data integration and management needs of USGS scientists to answer questions about climate, the environment, wildlife, and other interdisciplinary science topics.

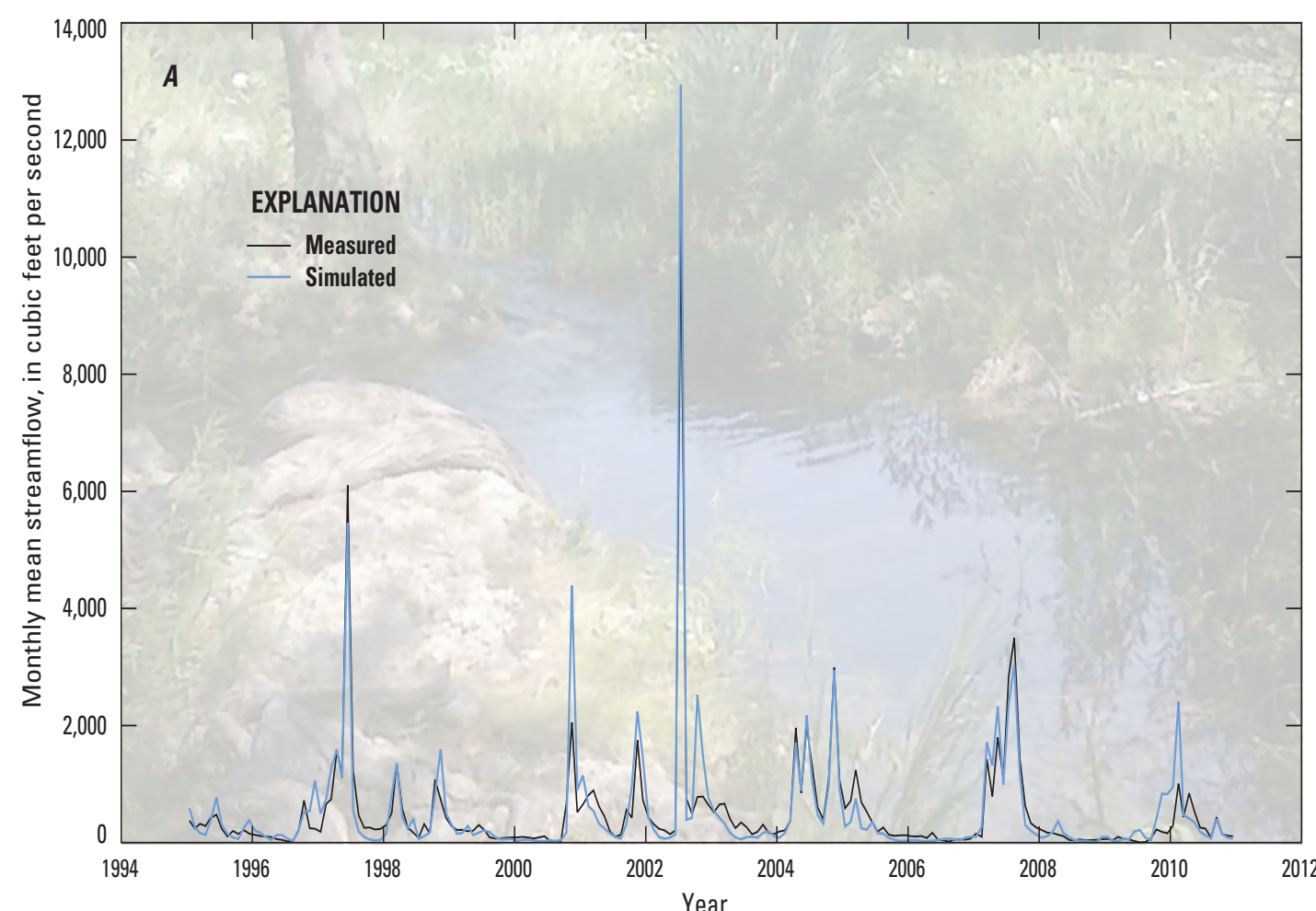
User Story: Quantifying Groundwater Availability



The Snapshot Tool was used to augment data from the High Plains Aquifer Water-Level Monitoring Study with daily groundwater level measurements. Selected levels are being used as targets to calibrate the Northern High Plains Aquifer groundwater flow model for the High Plains Groundwater Availability Study (<http://txpub.usgs.gov/HPWA>).

User Story: Modeling the Effects of Brush Management

The Snapshot Tool enabled rapid retrieval of 30 years of daily streamflow measured at a gage along the upper Guadalupe River. The measured streamflow was used to calibrate a Soil Water Assessment Tool (SWAT) model of the watershed. Resource managers are using the study results to guide brush management practices for the purpose of increasing water yields (*Bumgarner and Thompson, 2012*).



The Solution

The NWIS Web Services Snapshot Tool for ArcGIS (Snapshot Tool) enables rapid access to water information. It allows any ArcMap user to query USGS Water Services databases and download a “snapshot” (subset) of the NWIS data to a local Microsoft Access database. The geodatabase created by Snapshot is structured to allow the scientist to immediately begin working with the data, thus eliminating what once was a laborious and error-prone process of reconstructing a workable geodatabase.

This CDI-funded project leverages software development work used over the last decade by more than 22 USGS Water Science Centers; and by at least four USGS water availability programs to facilitate NWIS data retrieval and management (High Plains, Columbia River Plateau, Mississippi Embayment, and the Great Basin).

Key Features

- Instant access to site information, water-quality, instantaneous streamflow, and daily streamflow measurements
- Expert data management
- Streamlined integration with geospatial data
- Built-in education about water data for non-experts
- Rapid selection and translation of database codes
- Convenient, versatile water data access using familiar software (*Excel, Access, R, Matlab*)

References

Bumgarner, J.R., and Thompson, F.E., 2012, Simulation of streamflow and the effects of brush management on water yields in the upper Guadalupe River watershed, south-central Texas, 1995–2010: U.S. Geological Survey Scientific Investigations Report 2012–5051, 25 p.

Wanty, R.B., Verplanck, P.L., San Juan, C.A., Church, S.E., Schmidt, T.S., Fey, D.L., DeWitt, E.H., and Klein, T.L., 2009, Geochemistry of surface water in alpine catchments in central Colorado, USA—Resolving host-rock effects at different spatial scales: Applied Geochemistry, v. 24, no. 4, April 2009, p. 600–610.

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